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Comparison Between Prophylactic Use of Intravenous Dexmedetomidine and Intravenous Ketamine for Control of Post-Operative Shivering in Patients Undergoing Surgeries Under Spinal Anaesthesia

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ABSTRACT

Objective: To compare prophylactic use of intravenous Dexmedetomidine and intravenous Ketamine for control of post-operative shivering in patients undergoing surgeries under spinal anaesthesia.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Combined Military Hospital, Lahore Pakistan, from Feb to Aug 2022.

Methodology: Patients who were planning to undergo any surgical procedure under spinal anaesthesia other than caesarean section was included in the study. Random allotment to two groups was done for all the patients. One Group received intravenous Dexmedetomidine, while the other Group received intravenous Ketamine before the induction of spinal anaesthesia. Both groups were observed for three hours after the procedure in the recovery room for the presence of any significant shivering episode.

Results: Out of 350 patients randomised into two groups, 171(48.8%) took Dexmedetomidine and 179(51.2%) took intravenous Ketamine before routine spinal anaesthesia. The mean age of patients who underwent surgeries under spinal anaesthesia in our study was 46.76±8.78 years. Out of a total, 60(17.1%) had episodes of significant shivering after the surgery. Statistical analysis revealed that post-operative shivering (p-value<0.001) was seen statistically significantly less in the group of patients who were given Dexmedetomidine (p-value<0.001) as compared to those who were given Ketamine.

Conclusion: Post-operative shivering was seen in many patients undergoing various procedures under spinal anaesthesia. The use of Dexmedetomidine was found to be associated with less incidence of shivering as compared to the use of Ketamine in our study participants.

Keywords: Dexmedetomidine, Ketamine, Shivering, Spinal anaesthesia.

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INTRODUCTION

Surgeries performed under general anaesthesia are decreasing as spinal, local and regional anaesthetic techniques evolve in all parts of the world.[1] Statistics suggest that the maximum number of surgeries in the lower abdomen, perineum and lower limbs are performed under spinal anaesthesia.[2] This anaesthesia technique is usually safe, and most of the patients undergoing surgery under spinal anaesthesia have smooth recovery with limited or minor complications.[3,4]

Despite the very good safety profile of spinal anaesthesia, several minor complications or untoward effects are still seen in a considerable number of patients.[5] Shivering after the surgery is also one of the effects seen in a fairly good number of individuals.[6] Though usually not very alarming adverse effects, they still can be of significant value in some cases for the patient and the treating team. There have been set protocols in practice to prevent or manage shivering episodes after the surgery.[7,8]

Spinal anaesthesia is used as the primary mode of anaesthesia in surgeries of the lower abdomen, perineum and lower limb in our part of the world.[9] A study performed in another military hospital in Pakistan compared Pethidine and Ketamine for the treatment of post-operative shivering in patients undergoing surgeries under general anaesthesia and found Pethidine to be better for this purpose.[10] Limited local data is available regarding suitable agents to prevent post-operative shivering in patients operated under spinal anaesthesia. We, therefore, designed this study with the rationale of comparing the prophylactic use of intravenous Dexmedetomidine and intravenous Ketamine for the control of postoperative shivering in patients undergoing surgeries under spinal anaesthesia.

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METHODOLOGY

The comparative cross-sectional study was conducted at the Anaesthesia Department of Combined Military Hospital, Lahore Pakistan, from February to August 2022 after Ethical approval (letter number 412/2022) from the CHM Lahore Ethical Review Board Committee. The sample size was calculated using the WHO Sample Size Calculator taking Group-I with post-operative shivering with Ketamine at 46% and Group II with post-operative shivering with Dexmetomotidine at 24%.[9]

Inclusion Criteria: All patients aged 18-60 years who were planning to undergo any surgery except the caesarean section under spinal anaesthesia were recruited in the study.

Exclusion Criteria: Patients undergoing caesarean section under spinal anaesthesia or any other emergency surgeries were not included. Patients with redo surgeries or those classed ASA III or more were excluded from the study. Those who had a history of thyroid or recent fever, neuromuscular disease or any uncontrolled diabetes mellitus or hypertension were also excluded. Those patients having a history of narcotics or sedative use or serious adverse reactions with any of the drugs studied in the analysis were excluded as well.

Non-probability Consecutive sampling technique was used to gather the sample. Patients fulfilling the criteria and undergoing any surgery under spinal anaesthesia at the operation theatre of CMH Lahore were recruited in the study after written informed consent. All the presurgical and anaesthesia steps were taken as per routine protocols.[11] They were divided into two groups via lottery method. Patients in Group A received 0.4 microgram/kilogram of Dexmedetomidine diluted in 20ml over 10 minutes.[12] Patients in Group B received 0.3 milligram/kilogram of Ketamine diluted in 20ml over 10 minutes.[13] These medications were given to patients just before the induction of spinal anaesthesia. ASA standards of basic anaesthesia monitoring were adopted. The drug can cause a slight increase in blood pressure. Therefore, standard one and standard two anaesthetic monitoring were adopted. The patient should be held by nursing staff as the patient may get slight sedation to avoid a fall or any secondary injury. The treating teams operated on patients and then shifted to the recovery room, where the anaesthesia team observed them for three hours for the presence of any immediate complications, including post-operative shivering. Shivering was classed into four classes: 0 was regarded as no shivering; patients were classed as; 1) if piloerection or peripheral vasoconstriction was present but no visible muscular activity; it was graded as 2) if muscular activity in one muscle group was present, 3) if Muscle activity in more than one muscle group was observed but not generalised and 4) if generalised muscle activity in whole body was observed. Significant shivering was considered class 1 or above or requiring intravenous Meperidine for stabilising the patient.[14]

Statistical Package for Social Sciences (SPSS) version 25.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value of ≤0.05 was set as the cut-off value for significance.

RESULTS

A total of 350 patients undergoing any surgery under spinal anaesthesia other than caesarean section were recruited. They were randomised into two groups for comparison, so 171(48.8%) took Dexmedetomidine, and 179(51.2%) took intravenous Ketamine before routine spinal anaesthesia (Table-I).

Table-I: Characteristics of patients undergoing any Surgical Procedure under Spinal Anesthesia (n=350)

Study parameters	Values
Age (years)	
Mean+SD	44.99±9.689 years
Range (min-max)	23 years-60 years
Gender	
Male	208(59.4%)
Female	142(40.6%)
Type of Medication Used	
Intravenous Dexmedetomidine	171(48.8%)
Intravenous Ketamine	179(51.2%)
Post-Operative Shivering	
No	290(82.8%)
Yes	60(17.2%)
ASA Class	
I	242(69.1%)
II	108(30.9%)
Type of Surgery	
Inguinal hernia	152(43.4%)
Rectal surgeries	48(13.7%)
Lower limb surgeries	141(40.2%)
Others	09(2.5%)

The mean age of patients who underwent surgeries under spinal anaesthesia in our study was 44.99±9.68 years. Out of the total patients, 60(17.1%) had episodes of significant shivering after the surgery.

Patients were divided into two groups for comparison. Group-I had the patients who were given Dexmetomotidine while Group-II had the patients who were given Ketaimine. Post-operative shivering was seen statistically significantly less in the Group of patients who were given Dexmedetomidine (p-value<0.001) as compared to those who were given Ketamine in our study participants (Table-II).

Table-II: Comparison of Group-I (patients who were given Dexmetomotidine) and Group-II (Patients who were given Ketaimine) (n=350)

Factors	Patients who were given Dexmetomotidine n=171	Patients who were given Ketamine n=179	p-value
Gender			
Male	101(59.1%)	107(59.7%)	0.892
Female	70(40.9%)	72(40.3%)	
ASA Class			
I	126(73.6%)	116(64.8%)	0.072
II	45(26.4%)	63(35.2%)	
Post-Operative Shivering			
No	163(95.3%)	127(70.9%)	<0.001
Yes	08(4.7%)	52(29.1%)	
Type of Surgery			
Inguinal hernia	58(33.9%)	94(52.5%)	0.002
Rectal surgeries	32(18.7%)	16(8.9%)	
Lower limb surgeries	76(44.4%)	65(36.3%)	
Others	05(2.9%)	04(2.2%)	

DISCUSSION

We in our set conducted this study intending to compare the prophylactic use of intravenous Dexmedetomidine and intravenous Ketamine to control postoperative shivering in patients undergoing surgeries under spinal anaesthesia. Bozgeyik *et al.* studied patients with arthroscopy and compared the use of prophylactic Tramadol and Dexmedetomidine on post-surgical shivering. They revealed that both medications were effective, but Dexmedetomidine was slightly found more useful.[15] A double-blind RCT was published in 2021, which concluded that both intravenous Ketamine and Meperidine injected intrathecal worked well for the prevention of shivering. However, Meperidine was found to be the better of the two.[16] Post-operative shivering was seen in many patients undergoing various procedures under spinal anaesthesia. Younger patients were found to be more prone towards this adverse effect. The use of Dexmedetomidine was found to be associated with less incidence of shivering as compared to the use of Ketamine in our study participants, which clearly established that high-risk cases should be given this medication to prevent this cumbersome complication of spinal anaesthesia. Wang *et al.* concluded that Dexmedetomidine was superior to Clonidine for the prevention of shivering spells after the surgical procedure performed under spinal anaesthesia.[17] Our results supported the findings. However, we compared Dexmedetomidine with Ketamine instead of Clonidine, but the crux is the same: Dexmedetomidine remains superior to many alternatives in use for this purpose. Clinical and biochemical aspects of this property of Dexmedetomidine should be explored more to prevent or manage post-operative shivering. Another meta-analysis published in 2020 compared Dexmedetomidine versus Tramadol for the prevention of shivering after surgery performed under spinal anaesthesia. It was revealed that shivering control was better with Dexmedetomidine than Tramadol.[18]

Dexmedetomidine turned out to be a better option than Ketamine for the prevention of postoperative shivering in our data set, so more studies should be performed to find a better choice for our patients getting operated on under spinal anaesthesia.

LIMITATIONS OF STUDY

Shivering can occur due to multiple reasons in patients undergoing surgeries. Lack of control of all the confounding factors is an important limitation of our study. Our study design cannot reveal that Dexmedetomidine is protective against post-operative shivering. Randomised controlled trials, preferably placebo-controlled, can be useful in ascertaining the role of medications under study.

CONCLUSION

Post-operative shivering was seen in a considerable number of patients undergoing various procedures under spinal anaesthesia. The use of Dexmedetomidine was found to be associated with less incidence of shivering as compared to the use of Ketamine in our study participants.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

SSA & WT: Conception, study design, drafting the manuscript, approval of the final version to be published.

MAM & NKM: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

MRK & SK: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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